2019 Annual Survey of Public Employment & Payroll Methodology

The Annual Survey of Public Employment & Payroll measures the number of state and local civilian government employees and their gross payroll for the pay period including March 12 of the calendar year. Federal government agencies and institutions are excluded from this survey.

Population of Interest

The population of interest for the Annual Survey of Public Employment & Payroll includes the civilian employees of all agencies of the 50 state governments, and approximately 90,500 local governments (i.e., counties, municipalities, townships, special districts, and school districts) including the District of Columbia.

Content of the Survey

The survey provides state and local government full- and part-time employment, full-time equivalent employment, and payroll statistics by governmental function, such as financial administration, other government administration, judicial and legal, police protection (persons with power of arrest and other police protection), fire protection (firefighters and other fire protection), corrections, highways, air transportation, sea and inland port facilities, public welfare, health, hospitals, social insurance administration, solid waste management, sewerage, parks and recreation, housing and community development, natural resources, water supply, electric power, gas supply, transit, elementary and secondary education (instructional and other elementary and secondary education), higher education (instructional and other higher education), other education, libraries, and state liquor stores.

Beginning with the release of the 2019 Annual Survey of Public & Payroll, part-time hours are no longer included in the content that is collected and published.

The questionnaires that were used to collect these data can be viewed on the Questionnaires page of the Annual Survey of Public Employment & Payroll Website.

Critical definitions include the following:

Employment: Employment refers to all persons gainfully employed by, and performing services for, a U.S. government (excluding the federal government).

Employees: State and local government employees include all persons (excluding federal employees) paid for personal services performed, including persons paid from federally funded programs, paid elected or appointed officials, persons in a paid leave status, and persons paid on a per meeting, annual, semiannual, or quarterly basis. Unpaid officials, pensioners, persons whose work

is performed on a fee basis, and contractors and their employees are excluded from the count of employees.

Full-time employees: Full-time employees are defined to include those persons whose hours of work represent full-time employment in their employing government.

Part-time employees: Part-time employees are those persons who work less than the standard number of hours for full-time work in their employing government.

Full-time equivalent: Full-time equivalent (FTE) is a computed statistic representing the number of full-time employees plus part time employees converted to represent their contributions in full-time terms.

FTE is calculated using a linear model based on historical data from the 2014-18 period. The model estimates FTE values in each state by governmental function cell using values for full-time employees and part-time employees along with ratios based on linear relationships between part-time equivalent and part-time employee variables in the historical data. This model may be revised in the future based on new research.[1]

Payroll: Payroll amounts represent gross payroll for the 1-month period of March (31 days). Gross payroll includes all salaries, wages, fees, commissions, bonuses, or awards paid to employees during the pay period that includes the date of March 12. Payroll amounts reported for a period other than 1-month are converted to represent an amount for the month of March. All payroll figures are represented in current whole dollars and are not adjusted for inflation.

Conversion of a reported payroll to a payroll amount that would have been paid during a 31-day month is accomplished by multiplying the reported payroll by an appropriate factor. For example, a 2-week payroll is multiplied by the ratio of 31/14, a 1-week payroll is multiplied by the ratio of 31/7, and a twice-a-month payroll is multiplied by 2.

Data Collection

Authority and Confidentiality
Title 13, United States Code, Sections 161 and 182, authorizes the U.S. Census Bureau to conduct this collection. These data are subject to provisions of Title 13, United States Code, Section 9(b), which exempts data that are customarily provided in public records from rules of confidentiality.

[1] Prior to 2019, full-time equivalent (FTE) was calculated by summing the number of full-time employees and part-time equivalent (PTE) variables, where PTE was a function of part-time hours paid. Starting with the 2019 Annual Survey of Public Employment & Payroll, part-time hours are no longer collected.

Methods

Statistics in these files are based on information obtained in the Annual Survey of Public Employment & Payroll. Nearly all the state governments' data are provided from central payroll records for all or most of their agencies/institutions. Data for agencies and institutions for the remaining state governments and all local governments are obtained by online collection instrument. However, some elementary and secondary school system data are supplied by special arrangements with the state government.

Sample Design

The Annual Survey of Public Employment & Payroll consists of the 50 state governments and a sample of local governments. The sample of local governments for the Survey of Public Employment & Payroll is selected from the Census of Governments and updated annually with births and deaths. A two-stage sample was designed to produce state-by-type of government estimates with a relative standard error of three percent or less for FTE employees and total payroll at the national level. In the first stage, the sample design is stratified by probability proportional to size (PPS) of the local governments. In the second stage, a modified cut-off sample method was used to reduce the number of small cities, townships, and special districts included in the final sample. There are approximately 79,100 local governments from the population that are eligible for sampling.

Prior to sample selection, the sampling frame is stratified by state and type of government (county, city, township, special district, school district). For special districts, the sampling frame is sorted by function code within strata. (Note: See Chapter 12 of the <2006 Classification Manual> for the categories for classifying Employment data.)

Prior to the annual mail-out, the sampling frame is updated with newly discovered births and deaths. In general, birth units that are not special districts (counties, cities, townships, school districts) are added to the ASPEP sample with a weight of 1.0. If the group of special district births is small, all of them could be added to the ASPEP sample with a weight of 1.0. Once the group of special district births grows large enough, a sample is drawn to determine which units are added to the main ASPEP sample. Deaths are removed from the sampling frame and weights of the affected units are adjusted within strata.

Weighting

The weight for each unit in the sample is the reciprocal of that unit's probability of being selected into the sample. The weight was obtained as the product of two components: the weight applied for first stage PPS sampling multiplied by the weight applied for second stage cutoff sampling. The value of total payroll was used as the unit's measure of size.

Sample Size

The typical sample contains approximately 11,500 state and local governments. Of the total number of local governments in the sample, approximately 14 percent are counties, 31 percent are cities and townships, 24 percent are special districts, and 30 percent are school districts.[2] All 50 state governments, all Hawaii local units, and the District of Columbia are certainty units with a weight of 1.0.

Data Processing

Editing

Efforts are made at all phases of collection, processing, and tabulation to minimize reporting, keying, and processing errors.

Edits are built into the Internet data collection instrument and the data entry programs. Edits are also performed post collection. Post collection edits consist primarily of two types: (1) *consistency edits* and (2) *ratio edits*.

The *consistency edits* check the logical relationships of data items reported on the form. For example, if a value exists for employees for a governmental function then a value must exist for payroll also.

For each function reported for the employees, the *ratio edits* compare data for the number of employees and the average salary for the function between reporting years. If data fall outside of acceptable tolerance levels, the item is flagged for review.

For *ratio edits* and *consistency edits*, the edit results are reviewed by analysts and adjusted as needed. When the analyst is unable to resolve or accept the edit failure, contact is made with the respondent to verify or correct the reported data.

Imputation

For nonresponding general purpose governments, dependent and independent school districts, and for special district governments, the imputations were based on recent historical data from either a prior year annual survey or the most recent Census of Governments: Employment, if available. These data were adjusted by a growth rate that was determined by the growth of responding units that were similar (in size, geography, and type of government) to the nonrespondent. If there were no recent historical data available, the imputations were based on the data from a randomly selected responding donor that was similar (based on the same criteria) to the nonrespondent. For general purpose governments, and for dependent and independent school districts, the selected donor's data were adjusted by dividing each data item by the population (or enrollment) of the donor and multiplying the result by the nonrespondent's reported population (or enrollment) data.

[2] Due to rounding, numbers presented throughout this report may not add up precisely to the totals indicated and percentages may not precisely reflect the absolute figures for the same reason.

Estimation

Estimates of totals for employment statistics, total full-time employment, total full-time payroll, total full-time equivalent employment, total part-time employment, and total part-time payroll are calculated for each state-by-function “cell” (e.g., Corrections for Minnesota). To calculate estimates at such a detailed level, small area estimation is used. We employed a hybrid approach - a combination of various estimation methods.

There are three methods in the hybrid approach. First, the Horvitz-Thompson (HT) estimator is a weighted sum of the sample data. Intuitively, each unit in the sample represents itself and possibly many other units. To calculate the HT estimate, each data point in the sample is multiplied by its sampling weight, and then these values are summed over the corresponding area of interest. Second, the Empirical Best Linear Unbiased Prediction (EBLUP) estimator is used with a robust estimation approach that includes 2017 data as covariates. Third, the synthetic estimator is based on a Decision-based estimator of the state total and the assumption that employment in 2019 is proportional to employment in 2017 for the same state and function. The synthetic estimator is used when the cell has missing or no data. See the “For Further Information” section for papers related to these three estimation methods.

These methods have different tradeoffs. The HT estimator is unbiased, but it has high variability. The model-based EBLUP estimator, which is used most often of the three estimation methods, could be biased but it often performs very well and provides CV’s within 3 percent of the estimates at the national level. Similarly, the synthetic estimator can have a large bias, but it often has lower variance than that of the HT estimator and can be used even if no sample data are available for the cell.

Sampling Variability

The data that are provided come from a sample rather than a census of all possible units. A different sample would have yielded different estimates. The estimated coefficient of variation, which is provided for each estimate, is an estimate of the sampling variability. In this tabulation, the coefficients of variation are expressed as percentages. The coefficient of variation (CV) is the ratio of the standard error to the expectation of the estimate. A Taylor series method, or the estimate of the posterior distributions, is used to estimate the standard errors.

State government employment and payroll data are not subject to sampling error. Consequently, state and local government estimates for individual states are more reliable statistically than the local government only estimates.

Data Quality

Nonsampling Errors
The sample data are subject to nonsampling errors (such as, inability to obtain data for every variable from all units in the sample, inaccuracies in classification, response errors, misinterpretation of questions, mistakes in keying and coding, and coverage errors). These same errors may be evident in census collections and may affect the Census of Governments data used to adjust the sample during the estimation phase and used in the imputation process.

Overall Unit Response Rate
Further details about the most recent response rates can be found in the link below.

2019 Annual Survey of Public Employment & Payroll Response Rates and Notice - [PDF, <1.0 MB]

For Further Information:

Barth, Joseph, Yang Cheng, and Carma Hogue. "Reducing the Public Employment Survey Sample Size," Joint Statistical Meetings, 2009

Cheng, Yang, Casey Corcoran, Joseph Barth, and Carma Hogue. "An Estimation Procedure for the New Employment Survey Design," Joint Statistical Meetings, 2009

Cheng, Yang, Eric Slud, and Carma Hogue. "Variance Estimation for Decision-Based Estimators with Application to the Annual Survey of Public Employment and Payroll," Joint Statistical Meetings, 2010

Tran, Bac and Brian Dumbacher. "An Evaluation of Different Small Area Estimators for the Annual Survey of Public Employment and Payroll," Joint Statistical Meetings, 2014

Tran, Bac and Yang Cheng. "Application of Small Area Estimation for Annual Survey of Employment and Payroll," Joint Statistical Meetings, 2011